

Rapid Ecological Assessment for the Coulee Experimental Forest, La Crosse County, WI

A Summary of Biodiversity Values Focusing on Rare Plants, Selected Rare Animals, and High-quality Natural Communities in Preparation for the Development of a New Property Master Plan

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Natural Heritage Inventory Program
Bureau of Endangered Resources
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Cover Photos (clockwise from upper left): Dry-mesic Forest at Northeast Forest and Cliffs Primary Site, photo by Drew Feldkirchner; Kentucky Warbler, photo courtesy US Fish and Wildlife Service; side-oats grama (*Bouteloua curtipendula*), photo by Drew Feldkirchner; Western Slender Glass Lizard, photo by A.B. Sheldon.

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Purpose and Objectives

This report is intended to be used in conjunction with other sources of information for developing a new master plan for the Coulee Experimental Forest (CEF). This assessment addresses issues specifically related to the conservation of biological diversity for this property.

The primary objectives of this project were to collect biological inventory information relevant to the development of a master plan for the CEF and to analyze, synthesize and interpret this information for use by the master planning team. This effort focused on assessing areas of potential habitat for rare species and identifying natural community management opportunities.

As this property contains virtually no permanent water other than a small number of spring seeps, is much smaller, and supports a less complex mosaic of vegetation types than most state forest properties, survey efforts were limited to a “rapid assessment” for 1) identifying and evaluating ecologically important areas 2) documenting rare species occurrences, and 3) documenting occurrences of high quality natural communities. This report can serve as the “Biotic Inventory” document used for master planning, although it is a scaled down version in terms of both the time and effort expended when compared to similar projects conducted on much larger properties (see Appendix B). The information collected was the result of two partial seasons of survey work. There will, undoubtedly, be gaps in our knowledge of the biota of this property, especially for certain taxa groups; these groups have been identified by the Wisconsin Department of Natural Resources (WDNR) or others as representing either an opportunity or a need for future work.

Methods

The Wisconsin Natural Heritage Inventory (NHI) program resides in the Wisconsin DNR’s Bureau of Endangered Resources and is part of an international network of NHI programs. The defining and unifying characteristic of this network is the use of a standard methodology for collecting, processing, and managing data on the occurrences of natural biological diversity. This network of data centers was established by The Nature Conservancy and is currently coordinated by NatureServe, an international non-profit organization.

Natural Heritage Inventory programs focus on rare plant and animal species, natural communities, and other natural features, referred to as *elements* of biodiversity. Elements tracked by the Wisconsin NHI Program are listed on the Wisconsin NHI Working List. The Working List is the list of Endangered, Threatened and Special Concern plants, animals and natural communities maintained by the Wisconsin DNR. This list changes over time as the populations of species change (both up and down) and as knowledge about species and natural community status and distribution increases. The most recent Working List for the State of Wisconsin is available through the WDNR Endangered Resources Program (dnr.wi.gov/org/land/er/wlist/).

The Wisconsin NHI program uses a standard approach for biotic inventory work that supports master planning (Appendix A). Generally, the approach involves data collection and development, data analysis, and report writing. Details of standardized NHI methodology can be found on the NatureServe Web site: www.natureserve.org.

Existing NHI data are often the starting point for conducting a biotic inventory to support master planning. Prior to this project, NHI data for the CEF were limited to records from two earlier efforts: 1) county-by-county natural community surveys that were done in the 1970s and 2) snail surveys from the 1980s.

Field surveys for the current project were conducted during 2005-2006. Surveys were limited in scope due to the small size of the property and the lack of significant aquatic features. Survey efforts focused on documenting high quality natural communities, rare plants, and breeding birds. Herptile and invertebrate survey efforts were limited to opportunistic searches performed during the course of other survey work. The collective results from these surveys were used to identify ecologically important areas on the CEF. Additional bird surveys were conducted in 2007 at

two locations that were not adequately covered during previous field work, and a minimal amount of follow-up work was also needed at that time to re-evaluate a small, historical natural community record.

Survey locations were identified or guided by using recent aerial photos, USGS 7.5' topographic maps, various GIS sources, information from past survey efforts, discussions with Jim Dalton (property manager for the CEF), and the expertise of several biologists familiar with the property or with similar habitats in the region. Based on its location and ecological setting, key inventory considerations for the CEF included the identification of large blocks of contiguous forest, patches of relatively intact older forest with diverse structure (or the potential for developing structural attributes associated with older forests that are needed by some species), prairie remnants, and microsites such as cliffs and spring seeps that have relatively high potential for harboring rare or otherwise sensitive habitat specialists. Private lands surrounding the CEF were not surveyed. Virtually all of the adjoining private lands are, or have recently been, used for agricultural purposes.

General Background Information

The Coulee Experimental Forest (CEF) is located in east central La Crosse County - roughly 20 miles east of the city of La Crosse. The forest comprises ca. 2,944 acres and represents the only significant acreage of state owned upland forest in La Crosse County. Other nearby public lands are limited to two narrow, linear properties: the Coon Creek Fishery Area and the La Crosse River State Trail. The latter is within an active railroad right-of-way.

The CEF is owned by the state of Wisconsin but was dedicated as a USDA Forest Service Experimental Forest in 1960 for studying the effects of land use and steep land management on floods, soil erosion, and stream sedimentation (Adams et al. 2004). Research was conducted by the Forest Service until about 1976. Although the property is still officially a Forest Service Experimental Forest, it is now used for timber production, hunting, cross-country skiing, hiking, birding, and horseback riding.

Ecological Context

The study area is located in the southern half of Wisconsin within the *Western Coulee and Ridges* Ecological Landscape (Figure 1). This part of the state is characterized by rugged, deeply dissected ridge and valley topography with shallow soils over sandstone and dolomite bedrock (WDNR 2005). This landscape lies within the part of Wisconsin known locally as the Coulee region because of the abundant streams and ravines (“coulees”) formed by water erosion. The area comprising the CEF is also known as the Driftless Area – that portion of Wisconsin that was not directly affected by the glaciers that shaped the topography of the remainder of the state and much of the Upper Midwest. Drainage patterns are ‘dendritic’ and unlike those found in the glaciated portions of Wisconsin. There are no natural lakes within this Ecological Landscape, other than those occupying the backwaters of some of the larger rivers.

The CEF is within the Landtype Association (LTA) known as 222Lc16 - Roundtree Ridges, Tunnel City Hills, and Valleys-South. Soils for this LTA are well-drained and loamy soils with a silt loam or sandy loam surface over non-calcareous silty loess or over loamy or clayey residuum or colluvium (WDNR 2005). The soils of the CEF are formed in silty slope alluvium over loamy skeletal materials with some bedrock at <1 to 2 m. The footslope soils are formed in silty slope alluvium with occasional

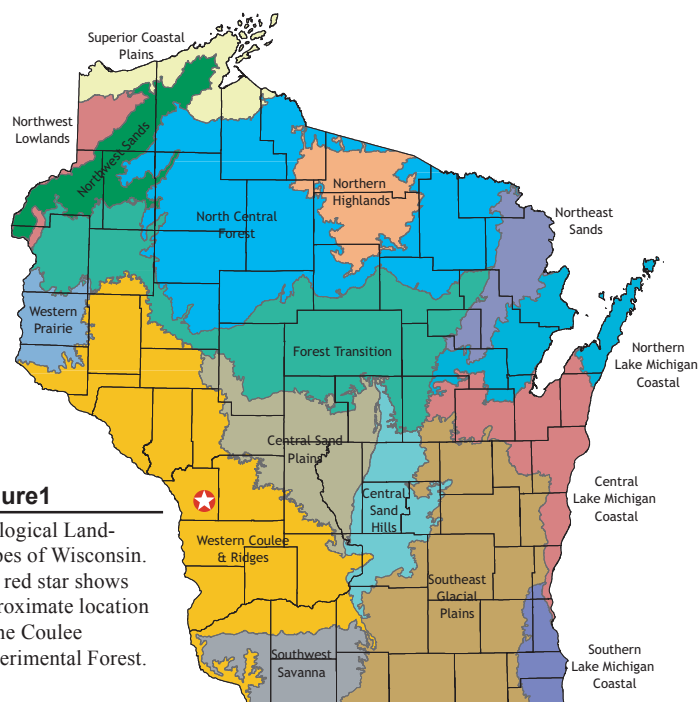
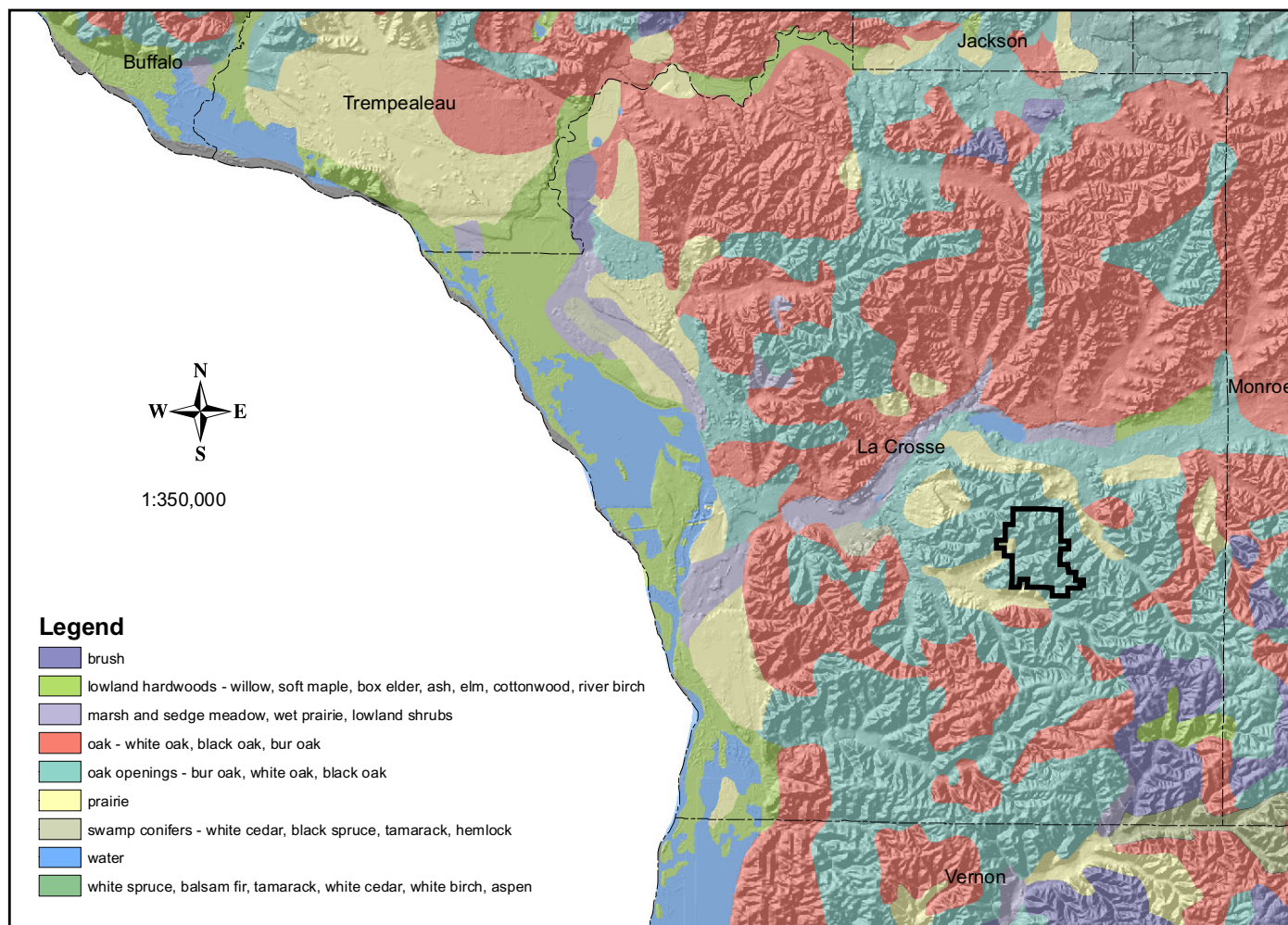


Figure 2

Presettlement Vegetation for the area comprising the Coulee Experimental Forest . Data are derived from Finley (1976).



rock fragments but with no bedrock within 2 m of the surface (Adams et al. 2004).

Public ownership comprises only three percent of the Western Coulee and Ridges Ecological Landscape. The area surrounding the CEF is almost entirely in private ownership and is characterized by working farms and scattered rural residences. The broader ridge tops and valleys are mostly cultivated for crops such as corn, soybeans, oats, and hay. Steep slopes are generally forested though sometimes pastured, and the forests are often used as sources of firewood and lumber.

Data from the original Public Land Surveys are often used to infer vegetation cover types for Wisconsin prior to European Settlement. Public Land Surveys for the portion of La Crosse County containing the CEF were conducted in the late-1840s. Finley's Original Vegetation Map (1976) described the area that now comprises the CEF as dominated by oak opening (bur oak, white oak, and black

Figure 3

Species frequency of "Witness Trees" from the Public Land Survey of the late 1840s for LaCrosse County.

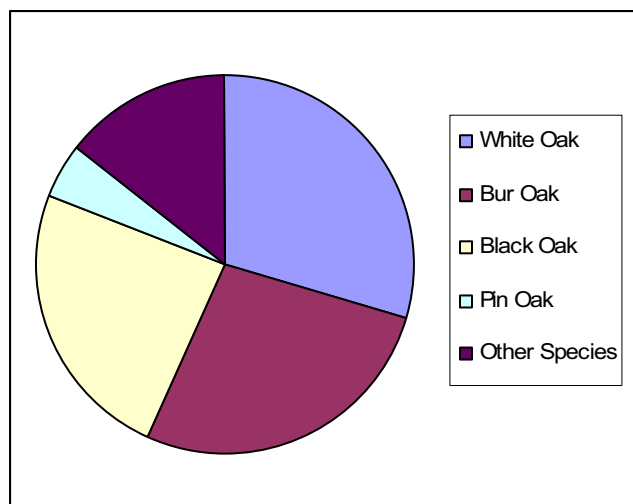


Table 1. Cover types from WISCLAND data for La Crosse County. WISCLAND cover types were derived using remote sensing from 1992 and are available as a WDNr GIS coverage.

Wiscland Cover Types	Percent of total area
Broad-leaved Deciduous Forest	37.3%
Agriculture	31.9%
Grassland	8.2%
Open Water	5.0%
Emergent / Wet Meadow	4.4%
Forested Wetland	3.3%
High Intensity Urban	2.8%
Low Intensity Urban	2.1%
Coniferous Forest	1.9%
Barren	1.7%
Lowland Shrub	0.8%
Mixed Deciduous / Coniferous Forest	0.7%

Table 2. Cover types for the Coulee Experimental Forest from WDNr Forest Reconnaissance data. Some of the exotic species plantations do not fit into typical Forest Reconnaissance categories. For example, the “Tamarack” category shown here is actually European larch. None of the conifers mentioned in this table are native to this property, though several occur nearby.

Cover Type	percent of forest
Oak	52.1%
Central Hardwoods	15.9%
Aspen	9.8%
Red Pine	5.3%
White Birch	4.5%
Fir, Fir-Spruce	3.3%
Northern Hardwoods	2.8%
Grass / Herbaceous	2.6%
White Pine	2.3%
Tamarack	1.0%
Upland Brush	0.4%
Other	0.1%

oak) prior to European settlement with small areas of prairie. The majority of La Crosse County was characterized as either oak forest, oak opening, or prairie, representing the structural continuum from relatively closed canopy oak forest – to semi-open oak savanna – to treeless prairie (Figure 2). The most notable exceptions to this vegetation pattern were in the lowland areas, particularly near the La Crosse and Mississippi rivers. Figure 3 shows the dominant “witness trees” from the Public Land Surveys for LaCrosse County, illustrating the prevalence of oak in this landscape at that time.

Current vegetation for the CEF is characterized by extensive areas of upland hardwood forest (Southern Dry-mesic Forest and Southern Dry Forest) interspersed with small native prairies (Dry Prairie, aka “goat prairie”, “bluff prairie”, or “dry lime prairie”), old fields, and various tree and agricultural plantings. There are plantations of various tree species throughout the property, in many cases resulting from reforestation projects and research related to tree species and seed sources. Some of the plantations are composed of exotic species such as European larch (*Larix decidua*) and Norway spruce (*Picea abies*). Prior to the establishment of the Experimental Forest, the level ridgetops and valley bottoms of the CEF were privately owned and used for agriculture, and many forested and non-forested areas were grazed. Some areas in the CEF are cropped via lease agreements as of this writing. There are small prairie plantings in certain areas in addition to the remnant native Dry Prairies. Bedrock outcroppings of dolomite or limy sandstone occur as low cliffs or ledges at a number of locations on the upper slopes of the ridges. None of the cliffs examined had vertical bedrock exposures of more than a few meters. Table 2 contains cover types for the CEF from Forest Reconnaissance data.

The CEF contains several large blocks of mature, relatively undisturbed hardwood forest. In some areas there are stands that are beginning to exhibit characteristics associated with old-growth forests, such as the presence of large biologically mature trees, standing snags, tip-ups, and coarse woody debris. Some of these areas feature richer soils on cooler, more moist, north-facing slopes. Numerous ferns and other more mesic understory plants are present. Even in the richer areas, however, sugar maple appears to be a minor component at this time.

Dry Prairies occur on the upper slopes of several ridges with steep southern and western exposures. Condition varies based on site characteristics, past land use, and the amount of active management that has occurred. DNR staff are restoring some of these sites by removing competing woody vegetation and using prescribed fire to maintain sites in a more open condition. Unmanaged prairies are often invaded by sumac (*Rhus* sp. native), autumn olive (*Eleagnus*

umbellata non-native) and other woody species, and have become ecologically simplified but have potential for restoration. There are a few examples of Dry Prairie on the property that have retained a suite of native species that are characteristic of the community type in this region.

Rare Species and High Quality Natural Communities

Several rare species and high-quality examples of native communities have been documented on the CEF (Table 3). In addition to the species listed in Table 2, American ginseng (*Panax quinquefolius*) was found on the property, a species that is not actively tracked by NHI but for which information is collected and maintained in manual files.

Table 3. Documented rare species and high-quality natural communities on the Coulee Experimental Forest. Species shown without a state rank or state status are Species of Greatest Conservation Need (see Appendix D) but are not on the NHI Working List. For an explanation of state and global ranks, as well as state status, see dnr.wi.gov/org/land/er/wlist/key.htm.

Common Name	Scientific Name	Year Last Observed	State Rank	Global Rank	State Status
Animals					
Acadian Flycatcher	<i>Empidonax virescens</i>	2006	S3B	G5	THR
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	2007	--	G5	--
Cerulean Warbler	<i>Dendroica cerulea</i>	2006	S2S3B	G4	THR
Hooded Warbler	<i>Wilsonia citrina</i>	2007	S2S3B	G5	THR
Kentucky Warbler	<i>Oporornis formosus</i>	1995	S1S2B	G5	THR
Louisiana Waterthrush	<i>Seiurus motacilla</i>	2006	S3B	G5	SC/M
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	2007	--	G5	--
smooth coil	<i>Helicodiscus singleyanus</i>	1986	S3	G5	SC/N
Veery	<i>Catharus fuscescens</i>	2007	--	G5	--
western slender glass lizard	<i>Ophisaurus attenuatus</i>	2006	S1	G5	END
wing snaggletooth	<i>Gastrocopta procera</i>	1986	S3	G5	THR
Wood Thrush	<i>Hylocichla mustelina</i>	2007	--	G5	--
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	2007	S3B	G5	SC/M
Plants					
autumn coral-root	<i>Corallorhiza odontorhiza</i>	2006	S3	G5	SC
jewelled shooting star	<i>Dodecatheon amethystinum</i>	2006	S2	G4	SC
purple-stem cliff-brake	<i>Pellaea atropurpurea</i>	2006	S2	G5	SC
shadowy goldenrod	<i>Solidago sciaphila</i>	1976	S3	G3G4	SC
white camas	<i>Zigadenus elegans</i> var. <i>glaucus</i>	2006	S2S3	G5T4T5	SC
yellow gentian	<i>Gentiana alba</i>	1999	S3	G4	THR
Communities					
Dry Cliff		2006	S4	G4G5	NA
Dry Prairie		2006	S3	G3	NA
Moist Cliff		2006	S4	GNR	NA
Southern Dry Forest		2006	S3	G4	NA
Southern Dry-mesic Forest		2006	S3	G4	NA

The following paragraphs give brief summary descriptions for each of the species and natural communities documented on the CEF. More information can be found on the Endangered Resources Web site (dnr.wi.gov/org/land/er) for several of these species and all of the natural communities.

Rare Animals

Acadian Flycatcher

The Acadian Flycatcher is a State Threatened bird that requires large unfragmented blocks of mature hardwood forest. The breeding season extends from mid-May through at least the end of July. Based on information from the

Wisconsin Wildlife Action Plan (WDNR 2006b) habitats which constitute Ecological Priorities for this species in the Western Coulee and Ridges Ecological Landscape include Southern Dry-mesic Forest, Southern Mesic Forest, and Floodplain Forest.

Cerulean Warbler

Cerulean Warbler is a State Threatened bird occurring most frequently in large stands of unfragmented, mature hardwood forest. At some locations its presence has been strongly associated with large canopy oaks, in both upland and lowland habitats. The breeding season extends from late May through July.

Kentucky Warbler

Kentucky Warbler is a State Threatened bird in Wisconsin. This species breeds in large tracts of unfragmented hardwood forest in southern Wisconsin, especially along the Mississippi and Wisconsin rivers, as well as in the Baraboo Hills. They nest in moist thickets with heavy undergrowth and lush ground vegetation, building their nests on or near the ground. The breeding season extends from mid-May through July. Based on information from the Wisconsin Wildlife Action Plan (WDNR 2006b) the habitats of highest Ecological Priority for this species in the Western Coulee and Ridges Ecological Landscape are large stands of Southern Dry-mesic Forest, Southern Mesic Forest and Floodplain Forest.

Louisiana Waterthrush

Louisiana Waterthrush is a bird of Special Concern in Wisconsin. This species breeds along rocky, high-gradient streams within relatively large, intact deciduous or mixed forests in the southern 2/3 of the state. It is sometimes found in Floodplain Forest near streams. Breeding occurs from May through July.

Smooth Coil

This small Special Concern land snail has been documented in Wisconsin among grasses and forbs on south or southwest-facing slopes, often with dolomite outcrops.

Western Slender Glass Lizard

This State Endangered reptile has a pointed snout, narrow head, and a long cylindrical body with no limbs, and is also called the glass snake or legless lizard. This species prefers oak savannas, dry-sand prairies, grasslands, and woodland edges. The breeding season for the glass lizard occurs from June through August. See dnr.wi.gov/org/land/er/factsheets/herps/slnliz.htm for more information.

Wing Snaggletooth

This tiny State Threatened land snail (the shell measures less than 2.5mm in length) occurs on hill or “goat” prairies (“Dry Prairie”) on calcareous bedrock with southern or western exposures in western Wisconsin. Populations may exist in an area of only a few square meters. The animals probably prefer to live under organic debris. In states to the south, the species inhabits woodland areas as well, but in Wisconsin it is restricted to open sites, which warm early enough in the spring to provide a growing season of at least 160 frost-free days, typical of the western Wisconsin hill prairies and glades. See WDNR (1999) for more information.

Rare Plants

Autumn coral-root

Autumn coral-root (*Corallorrhiza odontorhiza*) is an orchid of Special Concern in Wisconsin that prefers deciduous forest habitat. Most of our records are from the southern third of the state, but this species has been documented as far north as Taylor and Door counties. Flowering occurs from early August through mid-September. The optimal identification period is from early August to late September.

Jeweled Shooting Star

Jewelled shooting-star (*Dodecatheon amethystinum*) is a plant of Special Concern in Wisconsin that prefers moist, shaded dolomite and sandstone ledges and adjacent mesic woods on north-facing slopes. This species has a very limited distribution, not only in Wisconsin but across its entire range. Flowering occurs from early May through mid-June. Optimal identification period is from early May to late June.

Purple-stem Cliff-brake

Purple-stem cliff-brake (*Pellaea atropurpurea*) is a plant of Special Concern in Wisconsin that prefers dry, exposed sandstone and dolomite cliffs, and has been documented in 7 southwestern Wisconsin counties. Because this perennial fern is an evergreen it should be identifiable throughout the year.

Shadowy Goldenrod

Shadowy goldenrod (*Solidago sciaphila*), a plant of Special Concern in Wisconsin, is endemic to the unglaciated Driftless Area of southwestern Wisconsin and adjacent Illinois, Iowa, and Minnesota. This goldenrod prefers dry sandstone bluff edges, often under pines and/or oaks. Blooming occurs from mid-August through late September. Optimal identification period is throughout the month of September.

White Camas

White Camas (*Zigadenus elegans* var. *glaucus*) is a plant of Special Concern in Wisconsin that can be found in a range of habitats including oak openings, dry to dry-mesic prairie, limestone-capped sandstone bluffs, cliffs and other rock outcrops, and on stabilized dunes along Lake Michigan. White camas has mostly been found in the southern half of Wisconsin and along the shores of Green Bay and Lake Michigan. Blooming occurs from July through August.

Yellow Gentian

Yellow gentian (*Gentiana alba*), a State Threatened plant, occurs on thin soil in dry, open woodlands, ridges and bluffs (often with dolomite near the surface), moist sand prairies and roadside ditches, and clay soils of wooded ravines. This gentian typically blooms during the period from mid-August through mid-October. The optimal identification period is throughout the month of September.

Natural Communities

Dry Cliff

Dry vertical bedrock exposures occur on many different rock types, a factor which may influence species composition substrate stability. Scattered pines, oaks, or shrubs adapted to xeric conditions are often present. However, the most characteristic plants are often the ferns common polypody (*Polypodium vulgare*) and rusty woodsia (*Woodsia ilvensis*), along with herbs such as columbine (*Aquilegia canadensis*), harebell (*Campanula rotundifolia*), pale corydalis (*Corydalis sempervirens*), bush-honeysuckle (*Diervilla lonicera*), and rock spikemoss (*Selaginella rupestris*).

Dry Prairie

This grassland community occurs most frequently on dry, steep, south- or west-facing slopes, or at the summits of river bluffs with sandstone or dolomite near the surface. Most occurrences are in the Driftless Area. Soils are often wind-deposited loess, mixed with bedrock residuum. The community dominants typically include short to medium-height grasses such as little bluestem (*Schizachyrium scoparium*), side-oats grama (*Bouteloua curtipendula*), hairy grama (*B. hirsuta*), and prairie dropseed (*Sporobolus heterolepis*). Common shrubs and forbs may include lead plant (*Amorpha canescens*), silky aster (*Aster sericeus*), flowering spurge (*Euphorbia corollata*), purple prairie-clover (*Petalostemum purpureum*), cylindrical blazing-star (*Liatris cylindracea*), and gray goldenrod (*Solidago nemoralis*). Stands on gravelly knolls in the glaciated Kettle Moraine region of southeastern Wisconsin, and along the St. Croix River on the Minnesota-Wisconsin border, need additional study. These geographic outliers may warrant recognition by being split out from the type described above, at least at the “subtype” level.

Moist Cliff

Moist Cliff communities are vertical bedrock exposures that exhibit groundwater seepage through pores or fractures in the rock. Moist Cliffs are often associated with cool eastern or northern aspects, and may be shaded by overhanging trees. In the Driftless Area the most common rock types are sandstones and dolomites. Common plant species include columbine (*Aquilegia canadensis*), bulblet fern (*Cystopteris bulbifera*), fragile fern (*C. fragilis*), wood ferns (*Dryopteris* spp.), rattlesnake-root (*Prenanthes alba*), and harebell (*Campanula rotundifolia*). Many rare plants are associated with Moist Cliff habitats.

Southern Dry Forest

Mature, relatively undisturbed stands of Southern Dry Forest are often dominated by oaks, especially white oak (*Quercus alba*) and black oak (*Quercus velutina*). Canopy associates may include red oak (*Quercus rubra*), bur oak (*Q. macrocarpa*), bigtooth aspen (*Populus grandidentata*) and black cherry (*Prunus serotina*). In the well developed shrub layer, brambles (*Rubus* spp.), gray dogwood (*Cornus racemosa*), and American hazelnut (*Corylus americana*) are often common. Frequent herbaceous species are wild geranium (*Geranium maculatum*), false Solomon's-seal (*Smilacina racemosa*), hog-peanut (*Amphicarpaea bracteata*), and woodland sunflower (*Helianthus strumosus*).

Southern Dry-mesic Forest

Red oak is a common dominant tree of this upland forest community type. Common associates may include white oak (*Q. alba*), basswood (*Tilia americana*), red maple (*Acer rubrum*), sugar maple (*Acer saccharum*), and white ash (*Fraxinus americana*). Elms (*Ulmus* spp.) were formerly common in this type prior to the era of Dutch elm disease, but their presence has now been reduced to saplings and an occasional small tree. Characteristic understory plants may include jack-in-the-pulpit (*Arisaema triphyllum*), enchanter's-nightshade (*Circaea lutetiana*), large-flowered bellwort (*Uvularia grandiflora*), interrupted fern (*Osmunda claytoniana*), Lady Fern (*Athyrium filix-femina*), tick-trefoils (*Desmodium glutinosum* and *D. nudiflorum*), and hog peanut (*Amphicarpaea bracteata*). At many locations in the Driftless Area, oaks are being replaced by more mesophytic tree species, the combined result of current management practices and long-term fire suppression.

Management Considerations and Opportunities for Biodiversity Conservation

Previous efforts have highlighted the ecological importance of the CEF including the Land Legacy Report (WDNR 2006) which was designed to identify Wisconsin's most important conservation and recreation needs for the next 50 years. The CEF was assigned a score of two points on their five-point scale, meaning it possesses "good ecological qualities, may be of adequate size to meet the needs of some of the critical components, and/or harbors natural communities or species of state or ecological landscape significance." This category implies that although some restoration efforts might be needed for the area conservation actions would have a good chance of success.

Large relatively intact areas of upland forest on public or private lands are few within the Western Coulee and Ridges Ecological Landscape. Many of the remaining areas are becoming increasingly fragmented by development and parcelization. Forests such as those on the CEF are important for maintaining biological diversity, serving as biological laboratories, and providing reference areas for scientific research. These forests have the potential to support numerous rare species (such as those documented in this report), and the CEF contains some of the best opportunities in the area to develop and maintain relatively large blocks of high-quality upland forest, including representation of rare developmental or successional stages. The local landscape offers virtually no comparable opportunities for these forest communities and community matrices on public lands. High-grading of oak, grazing, and parcelization are common in many areas in this part of the state, and make the likelihood of discovering equivalent management and protection opportunities in the local landscape low.

The conifer plantations, though composed almost entirely of species neither native to this property nor to this region, can reduce 'high-contrast' edge, potentially provide habitat for species of interest (e.g., roosting owls), and partially offset some of the negative impacts of habitat fragmentation created by the old fields and pastures.

Wisconsin's remaining Dry Prairies persist mostly as small, isolated remnants, often on steep rocky hillsides that were unsuitable for other uses. Some of these occur on private land. In many cases, prairies have been negatively impacted by invasive plants, including woody species, which have increased because of long periods of fire suppression or heavy grazing. Despite these constraints, the Western Coulee and Ridges Ecological Landscape has the best opportunities in the state, and perhaps in the upper Midwest, to conserve this community type (WDNR 2005). In LaCrosse County, documented examples of Dry Prairie are limited to the areas immediately adjacent to the Mississippi River. Protection has been limited to a few sites and a small number of acres (Appendix C). Although prairies on the CEF are small and in need of active management, there are several good opportunities to conserve Dry Prairie and the associated oak-dominated continuum of savanna, woodland, and forest. Remnant prairies merit special consideration for protection, restoration, and management during the planning process.

Rare plants, birds, snails, and at least one reptile are supported on the CEF, including State Threatened and Endangered species and Species of Greatest Conservation Need (SGCN). All five of the vertebrates documented on the CEF are SGCN. In addition, other SGCN not identified during the course of this effort are likely to utilize habitats on the CEF. Protecting the known areas where these species have been documented, along with the best examples of potential habitats, provides an excellent opportunity to implement the Wisconsin Wildlife Action Plan and contribute to the conservation of several rare animal and plant species. Appendix D contains a listing of the SGCN known from the Western Coulee and Ridges Ecological Landscape that use the natural communities found on the CEF.

Native communities occur on the CEF that represent major management opportunities. From an ecological / biodiversity perspective, there are several natural community types that provide the best opportunities for management on the CEF. All of these community types also represent “Major Ecological Opportunities,” as defined by Ecological Landscapes Handbook (WDNR 2005) for the Western Coulee and Ridges Ecological Landscape.

The Ecological Landscapes Handbook identifies the best landscapes in the state for sustaining various natural communities and includes a table with opportunity ranks for each Ecological Landscape / Natural Community combination. There are 37 natural communities for which there are “Major” or “Important” opportunities in the Western Coulee and Ridges Ecological Landscape; of these, the following eight communities are present on the CEF:

- Dry Cliff
- Dry Prairie
- Moist Cliff
- Oak Opening
- Oak Woodland
- Southern Dry Forest
- Southern Dry-mesic Forest
- Surrogate Grasslands

The best-quality examples of natural communities documented on the CEF have been included in the “Primary Sites” presented in this report.

Several Ecological Priorities from the Wisconsin Wildlife Action Plan (WDNR 2006b) are present on the CEF. These priorities were developed using three primary sources of information: 1) the Ecological Opportunities previously described, 2) the degree of association that a given SGCN has for a given natural community, and 3) the probability that a given SGCN occurs in a given Ecological Landscape (e.g. see

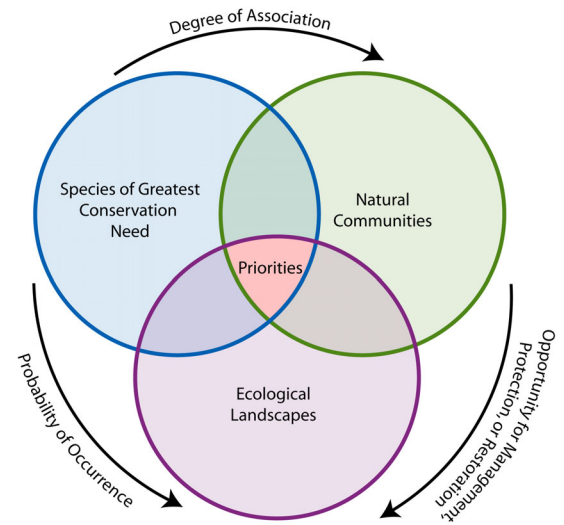


Figure 4
Graphic illustrating the process used for identifying Ecological Priorities in the Wisconsin Wildlife Action Plan.

dnr.wi.gov/org/land/er/wwap/explore/tool.asp for more information). Therefore, these priorities highlight both the ecologically important natural communities and vertebrate animal species for a given landscape, along with their relationships to each other.

All of the vertebrate SGCN known from the CEF along with the natural communities they inhabit represent “Ecological Priorities” for the Western Coulee and Ridges Ecological Landscape. Appendix D contains a matrix with the vertebrate SGCN and associated ecological opportunities (native communities) for this landscape. Note that these Ecological Priorities include all of the native communities that we have determined to provide the best opportunities for management on the CEF from an ecological / biodiversity perspective.

Invasive Plants did not appear to be a serious problem at any of the “Primary Sites” identified in this report (see “Site-specific Opportunities for Biodiversity Conservation”). However, several native and exotic plants considered to be invasive have been documented at other locations on the property including autumn olive, Japanese barberry, prickly ash, common buckthorn, Tatarian honeysuckle, garlic mustard, and black locust. Other invasive plants were not documented during this project, but there are several species which have the potential to become significant management problems, based on similar conditions, vegetation, and land use history at other properties within this landscape. Among this group, Eurasian buckthorns (*Rhamnus cathartica* and *R. frangula*), Eurasian honeysuckles (*Lonicera tatarica*, *L. morrowii*, and the hybrid *Lonicera X bella*) are of particular concern. The overall extent of garlic mustard is limited at this time, and control efforts have been initiated in problem areas. However, there is a serious garlic mustard infestation in one area on the CEF. The department will need to remain vigilant and eradicate invasive species before they become established to protect the high-quality areas on the CEF.

Lack of oak regeneration is a well-documented concern throughout Wisconsin in recent decades. The CEF, as an experimental forest dominated in many areas by oaks, should provide excellent opportunities to work on new regeneration techniques for oak, including planting, competition control, and deer control. Fire management techniques could be a component of this work. A long-term program could be established to monitor trial outcomes and provide useful information that would benefit the rest of the state.

Site-specific Opportunities for Biodiversity Conservation

The following Primary Sites were delineated because they generally encompass the best examples of 1) both rare and representative natural communities and 2) rare species populations that have been documented to date within the CEF. These sites warrant high protection and/or restoration consideration during the development of the new property master plan. Site boundaries and acreages provided are first approximations. This report is meant to be considered along with other information when identifying opportunities for various management designations during the master planning process. The site boundaries are illustrated on Figures 5 and 6.

Please note that the presence of rare species is only one consideration for site selection, and the dots shown on the map do not indicate the full extent of rare species occurrences. In addition, a particular dot may indicate the presence of one to several rare species. The sites were delineated so as to provide ecologically-based boundaries that incorporated the rare species and highest quality natural communities (or community matrices) contained by or associated with the site.

CE01. Northeast Forest and Cliffs - 292 acres

The largest of the Primary Sites, this site is located at the northernmost end of the CEF and features a large block of mature Southern Dry-mesic Forest that is developing old growth characteristics and has excellent structure and composition. The site also includes Moist Cliff outcroppings, a small but good-quality Dry Prairie with an associated Dry Cliff, and populations of several rare species.

The majority of the site is forested and occurs on the north-facing slope of a sandstone ridge. The forest is dominated by large-diameter red oak, white oak, basswood, and red maple. The upper slopes feature several series of The most intact portion of this site is of excellent quality, showing little or no evidence of past disturbance. It also supports rare

Figure 5

Primary Sites on the Coulee Experimental Forest

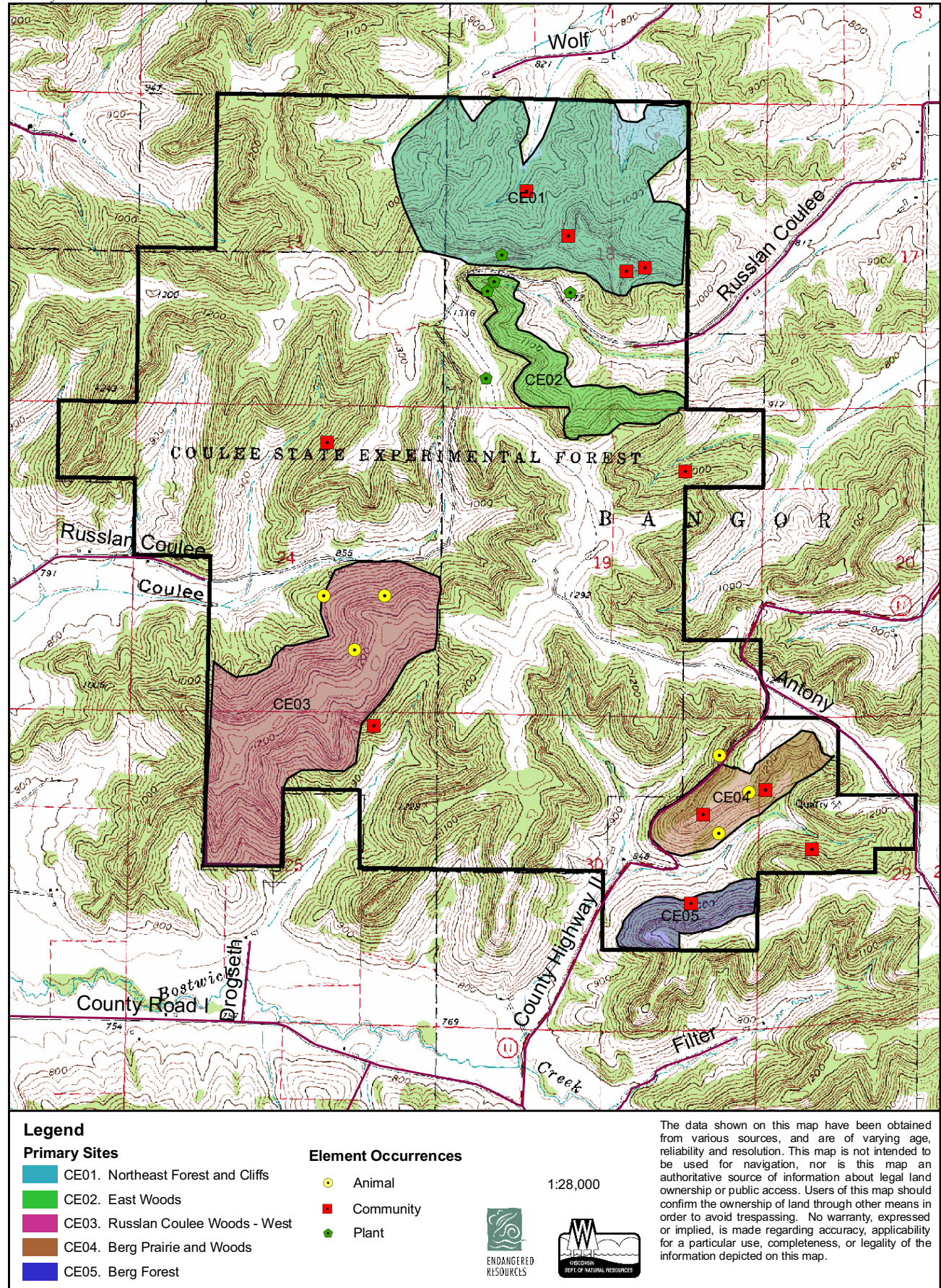
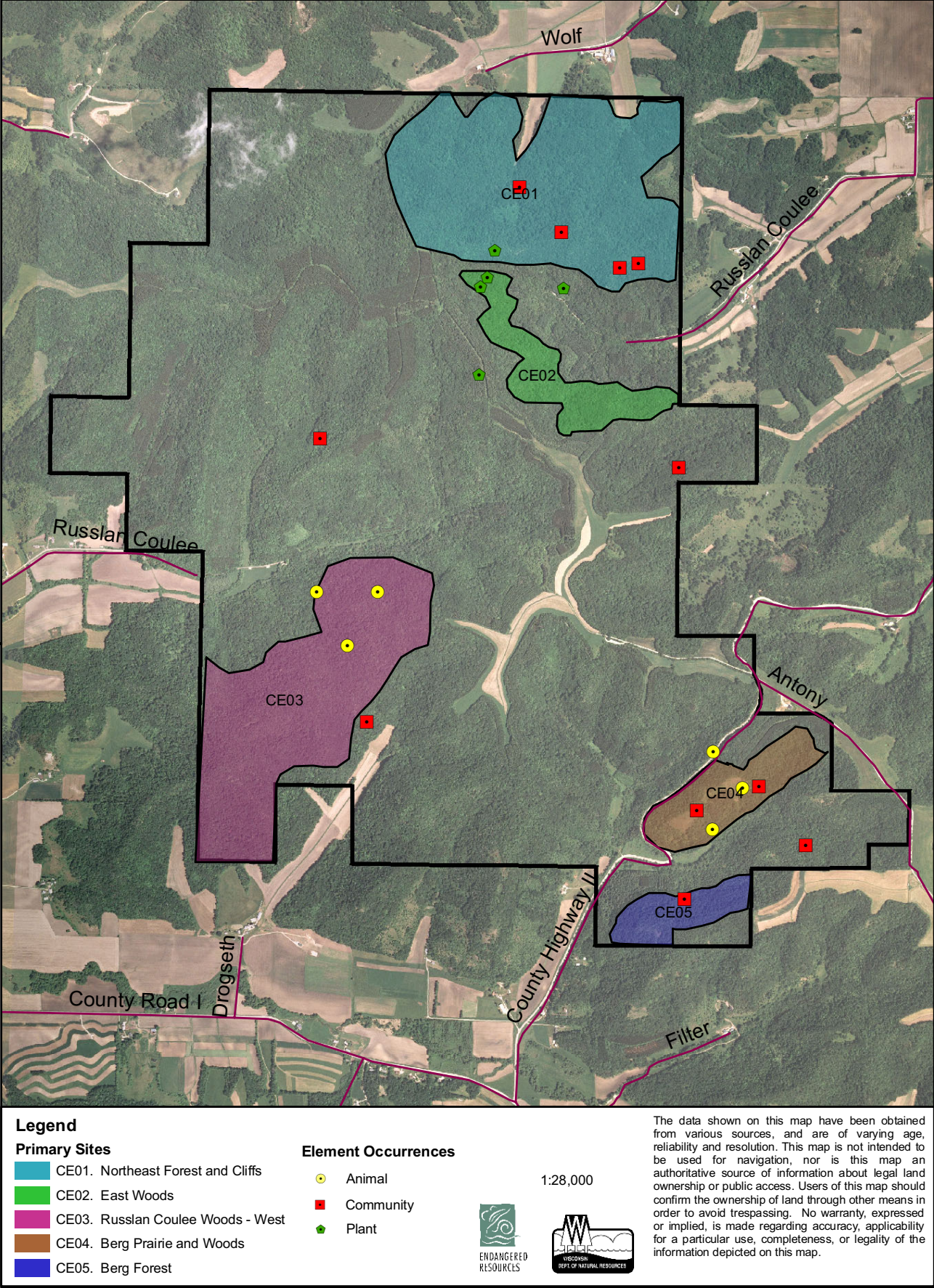


Figure 6

Primary Sites on the Coulee Experimental Forest



and the canopy includes red oak up to 45" in diameter. The southern end of the site contains a small Dry Prairie on a very steep south-facing slope. The prairie contains numerous plant species that are characteristic of this community type (e.g., little bluestem, side-oats grama, lead plant, silky aster, and gray goldenrod). The scattered prairie patches are associated with embedded Dry Cliffs, and the presence of open-grown bur and black oaks suggests the potential for savanna and native grassland restoration and management.

This site warrants long-term protection, as stands in this condition and with these structural characteristics are becoming increasingly rare throughout the southern half of the state. This area would make an excellent candidate for managing for a future old-growth forest, and perhaps for 'benchmark' status and is the best example offered by the CEF for developing an old-growth dry-mesic forest. In addition, although small, the prairie is generally of good quality and condition and could be expanded and improved via a management regime that included invasives control, brush removal and the use of prescribed fire. Because of its overall condition, high ecological value, and rare species populations, this site should be considered for State Natural Area designation.

CE02. East Woods - 65 acres

Patches of mature dry-mesic forest composed of red oak, white oak, basswood, shagbark hickory (*Carya ovata*), and red maple occupy the steeper east- and north-facing slopes of this sandstone ridge. Common saplings/small trees include basswood, American elm, and ironwood (*Ostrya virginiana*). The tall shrub layer consists of species such as gray dogwood (*Cornus racemosa*), hazelnut (*Corylus americanus*), and maple-leaved viburnum (*Viburnum acerifolium*). Among the representative herbs are lady fern, maidenhair fern (*Adiantum pedatum*), interrupted fern, wild geranium, jack-in-the-pulpit, tick-trefoils (*Desmodium spp*), and enchanter's nightshade.

The edges of this forest show evidence of heavy disturbance from past grazing and logging. Management activities might focus on restoring these degraded areas by encouraging the growth of oaks and hickories, and reducing the abundance of ironwood, red maple, paper birch (*Betula papyrifera*), elms, aspens, and black cherry. There may be opportunities to experiment with prescribed fire at this site. Reducing edge and increasing forest block size are potential long-term goals, but the configuration of the forest (very sinuous) and present condition of the lands bordering the site pose significant conservation constraints.

Our field work here was interrupted by severe weather and it would be desirable to do additional survey work here, especially in the southern and eastern portions of the site.

CE03. Russlan Coulee Forest - West - 240 acres

Russlan Coulee Forest is a large block of upland hardwood forest located in the southwest corner of the CEF. The primary natural community is Southern Dry-mesic Forest. The most intact stand occupies a mid-slope position on a north-facing ridge, and is embedded within a large matrix of more disturbed forest. The best stands are dominated by medium to large diameter red and white oaks. Associates include shagbark hickory, black cherry, red maple, big-tooth aspen & basswood. The herbaceous layer of the most intact areas are composed entirely of native species. The site is surrounded by younger or more disturbed stands of the same type, that include patches of paper birch, trembling aspen (*Populus tremuloides*), & American elm, along with the otherwise dominant oaks. The size and structure of this site makes it one of very few locations within the CEF in which rare forest interior birds were documented. Two State Threatened bird species, the Cerulean Warbler and Acadian Flycatcher, were documented here during a June 2006 breeding bird survey.

Because of its ecological importance, including its structure, composition, context, and the presence of rare species, this site should be considered for special management designation. Also, this site represents one of the larger tracts of relatively mature forest on the CEF, is known to support some rare breeding bird populations, and provides one of the better opportunities on the CEF and within this landscape to develop an old-growth forest core. It offers opportunities to expand forest area, reduce high contrast edge, and restore oak to areas from which it has been lost or diminished.

forest interior birds and several rare plants including jeweled shooting star. This portion of the site should be considered for special management status such as 'benchmark' or State Natural Area designation. Important management considerations for the surrounding forest and for some of the lower quality forest within the site include avoiding the creation of additional forest edge, reducing existing edge, encouraging the growth or restoration of oak where it has been diminished, and enlarging the area of forest available for sensitive species. discontinuous, shaded Moist Cliffs. The lower slopes are more mesic, supporting a relatively rich herbaceous flora,

CE04. Berg Prairie and Woods - 62 acres

Located in the southeast portion of the CEF along County Hwy II and occupying portions of a sandstone ridge, this site contains a mosaic of dry forest, semi-open woodland, and open prairie vegetation. The site features the largest known Dry Prairie remnant on the CEF (and, possibly, in the local area), embedded within small but good quality examples of Southern Dry Forest..

The largest area of Dry Prairie on the property covers only ca. 10 acres and occupies a ridge top and the steep adjoining upper slopes of that ridge. The slope aspect is to the south and southeast. There are also three very small (up to 1 acre) prairie openings scattered within the forested portions of the site. Although the site was formerly grazed, the prairie contains characteristic native Dry Prairie species such as little bluestem, side-oats grama, prairie dropseed, silky aster, gray goldenrod, and the regionally restricted prairie satin grass. Overall diversity of native prairie species was rated moderate at this time, but that could improve with implementation of appropriate management techniques.

The dominant canopy species of the forested portions of the site vary from semi-open grown bur and black oak near the ridge top to open-grown white oak towards the eastern portion of the site. It's likely that the site historically supported oak savanna vegetation, but it was almost certainly affected by a long period of grazing by domestic livestock as well as by an extended period of fire suppression. Associated tree species in the forested areas now include shagbark hickory, black cherry, and American elm. Shrub and understory composition varies according to canopy closure and light availability, but the woody understory is generally dense. Characteristic Oak Woodland / Oak Opening species (e.g., purple Joe-Pye-weed, showy goldenrod, and Robin's-plantain) are present in some areas that are only partially shaded. There are a few xeric rock outcrops scattered throughout the site.

This site warrants special consideration during master planning, as it offers a unique opportunity to restore a structural continuum of prairie – oak opening - oak woodland – oak forest. Prescribed burning and invasive species control will be needed to restore this site and to control competing woody vegetation. A pine plantation in the middle of the largest prairie patch would need to be removed. Invasive plants that currently occupy the site include Japanese barberry plants, as well as dense patches of prickly ash. In addition, autumn olive surrounds the site, and there are small to large scattered patches of it in the interior which could become a serious problem if not controlled. Although restoration work is needed, there are few comparable opportunities to maintain prairie and savanna vegetation on public landholdings in the immediate vicinity.

CE05. Berg Forest - 36 acres

Berg Forest is located in the far southeast corner of the CEF and features a good quality Southern Dry-mesic Forest. The site features a nearly pure stand of 12"-24" diameter red oak with a well-developed shrub layer dominated by round-leaved dogwood. Sub-canopy and sapling trees include American elm, basswood, bitternut hickory (*Carya cordiformis*), plus a few black cherry and box elder (*Acer negundo*). The understory composition is highly variable and contains many native species. No invasive plants were noted in the forest.

Although small, this site is in generally good condition. It has a diverse flora composed almost entirely of native species. There is a threat of autumn olive invasion following timber harvest at this site. Although this site is not a

strong candidate for a State Natural Area designation because of its small size and relative isolation, it could be considered for special management emphasis that would allow it to be used for research and/or monitoring designed to perpetuate a red and white oak canopy while maintaining a native understory..

Future Needs

This project was designed to provide a rapid assessment of the biodiversity values for the CEF. The project relied, in large part, on one field season of survey work. Although the report should be considered adequate for master planning purposes, additional efforts could help to inform future adaptive management efforts, along with providing useful information regarding the natural communities and rare species contained in the CEF.

- Invasives monitoring – establishing an invasives monitoring protocol will be critical for the CEF, especially if recreational uses are expected to increase following completion of the master plan. State parks and many other public lands throughout the surrounding landscape are facing major management problems because of serious infestations of highly invasive species such as garlic mustard, Eurasian buckthorns, and Eurasian honeysuckles. Some of these species are easily dispersed by humans and vehicles; others are spread by birds, mammals, insects, water, or wind. In order to protect the important biodiversity values of the CEF, a comprehensive plan will be needed for detecting and rapidly responding to new invasive threats. Citizens, such as trail users or local friends groups, could be encouraged to report new sightings of invasive plants and, perhaps, cooperate with property managers in control efforts.
- Vegetation plot data should be collected from the high quality natural communities on the property. Establishing baseline vegetation transects in some of the upland forests and along the prairie-forest continuum should also be considered.
- Additional surveys should be conducted for rare snakes and lizards, targeting those species now on Wisconsin's SGCN list, and for which good quality habitat occurs on or adjacent to the property.
- Prairie remnants potentially support rare terrestrial invertebrates. Additional surveys are desirable.
- Locations and likely habitats should be identified for conducting additional rare plant surveys during appropriate seasons.

Glossary

Ecological Landscape - landscape units developed by the WDNR to provide an ecological framework to support natural resource management decisions. The boundaries of Wisconsin's sixteen Ecological Landscapes correspond to ecoregional boundaries from the National Hierarchical Framework of Ecological Units, but sometimes combine subsections to produce a more manageable number of units.

Ecological Priority – the natural communities (habitats) in each Ecological Landscape that are most important to the Species of Greatest Conservation Need, as identified in the Wisconsin Wildlife Action Plan (WDNR 2006). Three sources of data were used to derive this information: 1) the probability that a species will occur in a given landscape, 2) the degree to which a species is associated with a particular natural community, and 3) the degree to which there are opportunities for sustaining a given natural community in any given Ecological Landscape. See dnr.wi.gov/org/land/er/wwap/explore/tool for more information.

element occurrence - An Element Occurrence (EO) is an area of land and/or water in which a rare species or natural community is, or was, present. An EO should have practical conservation value for the Element as evidenced by potential continued (or historic) presence and/or regular recurrence at a given location. For species, the EO often corresponds with the local population, but when appropriate may be a portion of a population (e.g., a single nest territory or long distance dispersers) or a group of nearby populations (e.g., metapopulation). For communities, the EO may represent a stand or patch of a natural community or a cluster of stands or patches of a natural community. Because they are defined on the basis of biological information, EOs may cross jurisdictional boundaries (modified from <http://whiteoak.natureserve.org/eodraft/index.htm>)

Landtype Association (LTA) - a level in the National Hierarchical Framework of Ecological Units (see next entry) representing an area of 10,000 – 300,000 acres. Similarities of landform, soil, and vegetation are the key factors in delineating LTAs.

National Hierarchical Framework of Ecological Unit - a land unit classification system developed by the U.S. Forest Service and many collaborators. As described by Avers et al (1994): “The NHFEU can provide a basis for assessing resource conditions at multiple scales. Broadly defined ecological units can be used for general planning assessments of resource capability. Intermediate scale units can be used to identify areas with similar disturbance regimes. Narrowly defined land units can be used to assess specific site conditions including: distributions of terrestrial and aquatic biota; forest growth, succession, and health; and various physical conditions.”

natural community – an assemblage of plants and animals, in a particular place at a particular time, interacting with one another, the abiotic environment around them, and subject to primarily natural disturbance regimes. Those assemblages that are repeated across a landscape in an observable pattern constitute a community type. No two assemblages, however, are exactly alike.

natural community occurrence - a place on the landscape that supports an example of a natural community that has been surveyed and evaluated by ecologists using standard NHI methodology and meets minimum criteria for condition, context, and size.

parcelization – subdividing land into smaller, more numerous parcels, often resulting in more individual landowners within a given parcel

“rare” natural community - in this context the modifier can refer either to the relative scarcity of the community type itself, to the scarcity of a particular developmental stage, or to a specific attribute of the community occurrence.

“relatively intact” (or “intact”) used to refer to forests (in this case) that do not exhibit (or only moderately exhibit)

the effects of recent disturbance caused by both natural and/or anthropogenic disturbances. These forests often exhibit crown closure that approximates that achieved in the absence of artificial or major natural disturbance, and the best examples may contain specialized attributes that are desirable for certain Species of Greatest Conservation Need, including coarse woody debris, standing dead snags, and a complex vertical structure with trees and shrubs present in different size classes.

representative - native plant species that would be expected to occur in native plant communities influenced primarily by natural disturbance regimes in a given landscape - e.g., see Curtis (1959).

SGCN (or “Species of Greatest Conservation Need”) – native wildlife species with low or declining populations that are most at risk of no longer being a viable part of Wisconsin’s fauna (from the “Wisconsin Wildlife Action Plan,” WDNR 2006b).

surrogate grasslands – these are the main habitats (e.g., CRP, old field, pasture) now available for birds that require grasslands, especially large grasslands, for portions or all of their life cycles. These communities are similar in structure (but not species composition) to the native prairies and open (i.e., recently burned) barrens that were formerly much more abundant in Wisconsin. The dominant plants in “surrogate” grasslands are typically exotic “cool season” grasses. See Sample and Mossman (1997) for more information.

witness tree – trees near section, quarter, and meander quarters that were marked and recorded during the original public land surveys (during the 1800s in Wisconsin) to allow for these points to be relocated.

Species List

The following is a list of species referred to by common name in the report text.

Common Name	Scientific Name
Animals	
Acadian Flycatcher	<i>Empidonax virescens</i>
Cerulean Warbler	<i>Dendroica cerulea</i>
Kentucky Warbler	<i>Oporornis formosus</i>
Louisiana Waterthrush	<i>Seiurus motacilla</i>
Smooth Coil	<i>Helicodiscus singleyanus</i>
Western Slender Glass Lizard	<i>Ophisaurus attenuatus</i>
Wing Snaggletooth	<i>Gastrocopta procera</i>
Plants	
American elm	<i>Ulmus americana</i>
American ginseng	<i>Panax quinquefolius</i>
American hazelnut	<i>Corylus americana</i>
autumn coral-root	<i>Corallorhiza odontorhiza</i>
autumn olive	<i>Elaeagnus umbellata</i>
basswood	<i>Tilia americana</i>
big-tooth aspen	<i>Populus grandidentata</i>
bitternut hickory	<i>Carya cordiformis</i>
black locust	<i>Robinia pseudoacacia</i>
black oak	<i>Quercus velutina</i>
broad-leaf enchanter's-nightshade	<i>Circaea lutetiana</i>
brambles	<i>Rubus</i> spp.
bulblet fern	<i>Cystopteris bulbifera</i>
bur oak	<i>Quercus macrocarpa</i>
bush-honeysuckle	<i>Diervilla lonicera</i>
common buckthorn	<i>Rhamnus cathartica</i>
common polypody	<i>Polypodium vulgare</i>
cylindrical blazing-star	<i>Liatris cylindracea</i>
dame's rocket	<i>Hesperis matronalis</i>
"Eurasian buckthorns"	<i>Rhamnus cathartica</i> , <i>R. frangula</i>
"Eurasian honeysuckles"	<i>Lonicera morrowii</i> , <i>L. tatarica</i> , <i>L. X bella</i>
false Solomon's-seal	<i>Smilacina racemosa</i>
flowering spurge	<i>Euphorbia corollata</i>
fragile fern	<i>Cystopteris fragilis</i>
garlic mustard	<i>Alliaria petiolata</i>
gray dogwood	<i>Cornus racemosa</i>
gray goldenrod	<i>Solidago nemoralis</i>
hairy grama	<i>Bouteloua hirsuta</i>
harebell	<i>Campanula rotundifolia</i>
hog-peanut	<i>Amphicarpaea bracteata</i>
"hybrid honeysuckle"	<i>Lonicera X bella</i>
interrupted fern	<i>Osmunda claytoniana</i>
Jack-in-the-pulpit	<i>Arisaema triphyllum</i>
Japanese barberry	<i>Berberis thunbergii</i>
jewelled shooting star	<i>Dodecatheon amethystinum</i>
lady fern	<i>Athyrium filix-femina</i>
large-flowered bellwort	<i>Uvularia grandiflora</i>
lead-plant	<i>Amorpha canescens</i>
little blue-stem	<i>Schizachyrium scoparium</i>

Common Name	Scientific Name
Plants continued...	
multiflora rose	<i>Rosa multiflora</i>
northern pin oak	<i>Quercus ellipsoidalis</i>
pale corydalis	<i>Corydalis sempervirens</i>
paper birch	<i>Betula papyrifera</i>
prairie drop-seed	<i>Sporobolus heterolepis</i>
prairie satin grass	<i>Muhlenbergia cuspidata</i>
prickly-ash	<i>Zanthoxylum americanum</i>
purple Joe-Pye-weed	<i>Eupatorium purpureum</i>
purple prairie-clover	<i>Dalea purpurea</i>
purple-stem cliff-brake	<i>Pellaea atropurpurea</i>
rattlesnake-root	<i>Prenanthes alba</i>
red maple	<i>Acer rubrum</i>
red oak	<i>Quercus rubra</i>
Robin's-plantain	<i>Erigeron pulchellus</i>
rock spike-moss	<i>Selaginella rupestris</i>
round-leaved dogwood	<i>Cornus rugosa</i>
rusty woodsia	<i>Woodsia ilvensis</i>
shagbark hickory	<i>Carya ovata</i>
showy goldenrod	<i>Solidago speciosa</i>
side-oats grama	<i>Bouteloua curtipendula</i>
silky aster	<i>Aster sericeus</i>
sugar maple	<i>Acer saccharum</i>
Tartarian honeysuckle	<i>Lonicera tatarica</i>
pointed tick-trefoil	<i>Desmodium glutinosum</i>
naked tick-trefoil	<i>Desmodium nudiflorum</i>
white ash	<i>Fraxinus americana</i>
white camas	<i>Zigadenus elegans</i> var. <i>glaucus</i>
white oak	<i>Quercus alba</i>
wild black cherry	<i>Prunus serotina</i>
wild columbine	<i>Aquilegia canadensis</i>
wild geranium	<i>Geranium maculatum</i>
wood fern	<i>Dryopteris</i> spp.
woodland sunflower	<i>Helianthus strumosus</i>
yellow gentian	<i>Gentiana alba</i>

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APPENDIX A

Natural Heritage Inventory Overview and General Methodology

The Coulee Experimental Forest Ecological Assessment was conducted by the Wisconsin Natural Heritage Inventory (NHI) program, which is part of an international network of NHI programs. The defining characteristic of this network, and the feature that unites the programs, is the use of a standard methodology for collecting, processing, and managing data on the occurrences of natural biological diversity. This network of data centers is coordinated by NatureServe, an international non-profit organization.

Natural Heritage Inventory programs focus on rare species, natural communities, and other rare elements of nature. When NHI programs are established, one of the first tasks facing the staff is to consolidate existing information on the status and location of rare elements. Before proceeding, the NHI program must determine what elements warrant “tracking” and which are more common. Similar to most states, Wisconsin biologists had a general idea of which species in the better-studied taxonomic groups (e.g., mammals, birds, and vascular plants) were rare or declining. For less-studied groups such as macroinvertebrates, the process of assembling the list of species to track and gathering the data were quite dynamic. Initially, NHI staff cast a wide net, collecting data on many species from existing sources (e.g., scientific literature, field guides, books, maps, and museum collections) as well as from direct contact with experts throughout the state. As more data were gathered, it was clear that some species were more common than originally thought and the NHI program stopped collecting data on them. Thus, the list of which elements are tracked, the NHI Working List, changes over time as species’ populations change (both up and down) and as our knowledge about their status and distribution increases. This evolution continues today, with the NHI Working List typically going through several revisions a year. The most current Wisconsin Natural Heritage Working List for the State of Wisconsin is available through the NHI office and on the Endangered Resources Program Web pages (dnr.wi.gov/org/land/er/wlist/).

In general, there are two approaches to surveying biodiversity: (1) those focused on locating occurrences of particular elements, and (2) those focused on assessing the components of a particular area. The latter approach employs a “top down” analysis that begins with an assessment of the natural communities and aquatic features present, their relative quality and condition, the surrounding landscape pattern, and current land use and results in the identification of future species-oriented surveys. This approach, commonly referred to as “coarse filter-fine filter,” concentrates inventory efforts on those sites most likely to contain target species. It also allows sites to be placed in a larger, landscape context for more broad applications of ecosystem management principles.

For the Coulee Experimental Forest, a top-down, coarse filter-fine filter approach was used. The initial analysis assessed the entire region and determined the important ecological attributes and the biological processes supporting them. Criteria to evaluate sites were established and then vegetative communities were identified and characterized. Based upon existing habitat characteristics and known habitat preferences of various rare species, sites where species-specific surveys were most appropriate were identified. ***No doubt, occurrences of rare species exist that were not located through these inventories.*** However, by concentrating inventory efforts on the highest quality or otherwise suitable sites, it is most likely that the populations with the highest conservation value were located.

The NHI methodology for organizing and storing data is actually a system of three inter-related data storage techniques: structured manual information files, topographic map files, and a computer database that integrates the various information. The computer component, known as Biotics, is a sophisticated relational database management application with both tabular and spatial components.

Methods of Inventory

The following is a description of standard NHI methods for conducting NHI inventories. Any step may be modified, dropped, or repeated as appropriate to the project.

File Compilation: Involves obtaining existing records of natural communities, rare plants and animals, and aquatic features for the study area and surrounding lands and waters from the Biological & Conservation Data system, housed within DNR's Natural Heritage Inventory. Other databases with potentially useful information may also be queried, such as: forest stand/compartments reconnaissance, which is available for many public agency owned lands; the DNR Surface Water Resources series for summaries of the physical, chemical, and biological characteristics of lakes and streams (statewide, by county); the Milwaukee Public Museum's statewide Herp Atlas; museum/herbarium collections for various target taxa; soil surveys; and the fish distribution database (by watershed, WDNR-Research).

Additional data sources are sought out as warranted by the location and character of the site, and the purpose of the project. Manual files maintained within the Bureau of Endangered Resources contain information on a variety of subjects relevant to the inventory of natural features and are frequently useful.

Literature Review: Field biologists involved with a given project consult basic references on the natural history and ecology of the region within which the study area is situated. This can both broaden and sharpen the focus of the investigator.

Target Elements: Lists of target elements including natural communities, rare plants and animals, and aquatic features are developed for the study area. Field inventory is then scheduled for the times when these elements are most identifiable or active. Inventory methods follow accepted scientific standards for each taxon.

Map Compilation: USGS 7.5 minute topographic quadrangles serve as the base maps for field survey and often yield useful clues regarding access, extent of area to be surveyed, developments, and the presence and location of special features.

WDNR wetland maps consist of aerial photographs upon which all wetlands down to a scale of 2 or 5 acres have been delineated. Each wetland polygon is classified based on characteristics of vegetation, soils, and water depth.

Ecoregion maps are useful for comprehensive projects covering large geographic areas such as counties, national and state forests, and major watersheds. These maps integrate basic ecological information on climate, landforms, geology, soils, and vegetation. As these maps evolve, they should become increasingly useful, even for relatively small, localized projects.

Geographic Information Systems (GIS) are routinely used to allow for efficient and comprehensive planning of surveys, as well as analysis of the results.

Aerial photographs: These provide information on a study area not available from maps, paper files, or computer printouts. Examination of both current and historical photos, taken over a period of decades, can be especially useful in revealing changes in the environment over time. Both hard copy and digital versions of air photos are used for these projects.

Original Land Survey Records: The surveyors who laid out the rectilinear Town-Range-Section grid across the state in the mid-nineteenth century recorded trees by species and size at all section corners and along section lines. These notes also record general impressions of vegetation, soil fertility, and topography, and note aquatic features, wetlands, and recent disturbances such as windthrow and fire. As these surveys typically occurred prior to extensive settlement of the state by Europeans, they constitute a valuable record of conditions prior to extensive modification of the landscape by European technologies and settlement patterns.

Interviews: Interviews with scientists, naturalists, land managers or others knowledgeable about the area to be surveyed often yield information not available in other formats.

Analysis of Compiled Information: The compiled information is analyzed to identify inventory priorities, determine needed expertise, and develop budgets.

Meetings: Planning and coordination meetings are held with all participants to provide an overview of the project, share information, identify special equipment needs, coordinate schedules, and assign landowner contact responsibilities.

Aerial Reconnaissance: Fly-overs are desirable for large sites, and for small sites where contextual issues are especially important. When possible, this should be done both before and after ground level work. Flights are scheduled for those times when significant features of the study area are most easily identified and differentiated. They are also useful for observing the general lay of the land, vegetation patterns and patch sizes, aquatic features, infrastructure, and disturbances within and around the site.

APPENDIX B

Sizes and Locations of Wisconsin DNR Northern Forests

The following are Wisconsin DNR "Northern Forests."

Property	Acres
Northern Highland American Legion State Forest	259,167
Flambeau River State Forest	91,092
Black River State Forest	69,250
Brule River State Forest	44,574
Governor Knowles State Forest	20,250
Peshtigo River State Forest	6,422
Coulee Experimental Forest	2,973

APPENDIX C

State Natural Areas and Other Ecological Reference Sites in La Crosse and Vernon Counties

These sites protect examples of features that are similar to the ecologically important areas documented on the Coulee Experimental Forest.

Site Name	County	Owner / Manager	Total Acreage	Notes
Midway Railroad Prairie (SNA # 18)	Vernon	US Fish and Wildlife Service	3	Tiny Dry-mesic sand prairie remnant on a western-facing slope of a Mississippi River terrace.
Battle Bluff Prairie (SNA # 177)	Vernon	WDNR	348	Dry Prairie on a steep south-facing slope with Southern Dry Forest
La Crosse River Trail Prairies (SNA # 184)	Monroe, La Crosse	WDNR	91	Narrow, linear Dry-mesic to Dry Prairie in a former railroad right-of-way
Kickapoo Valley Reserve (SNA # 354)	Vernon	State of Wisconsin and Bureau of Indian Affairs	3,600	Extensive forested landscape with numerous cliffs and forested bluffs
Great River Trail Prairies (SNA # 357)	La Crosse, Trempealeau	WDNR	33	Diverse Sand Prairie remnants located an old railroad right-of-way
Bergen Bluffs (SNA # 415)	Vernon	WDNR	30	Southern Dry-mesic Forest with sandstone and limestone rock outcrops
Romance Prairie (SNA # 418)	Vernon	WDNR	75	Small Dry Prairie and restorable Oak Savanna situated on a steep southwest-facing slope
Satin Grass (Stry) Prairie	La Crosse	City of La Crosse	55	Dry Prairie is limited to several small remnants on west and south-facing cliffs

APPENDIX D

Coulee Experimental Forest Species of Greatest Conservation Need

The following are vertebrate Species of Greatest Conservation Need (SGCN) associated with natural community types that are present on the Coulee Experimental Forest from the Western Coulee and Ridges Ecological Landscape. Only SGCN with a high or moderate probability of occurring in the Western Coulee and Ridges Ecological Landscape are shown. Communities shown here are limited to those identified as “Major” or “Important” management opportunities in the Wisconsin Wildlife Action Plan (WDNR 2006b). Letters indicate the degree to which each species is associated with a particular habitat type (S=significant association, M=moderate association, and L=low association). Animal-community combinations shown here that are assigned as either “S” or “M” are also Ecological Priorities, as defined by the Wisconsin Wildlife Action Plan (see dnr.wi.gov/org/land/er/WWAP/ for more information about these data). Shaded species have been documented at the Coulee Experimental Forest.

	Dry Cliff	Dry Prairie	Moist Cliff	Oak Opening	Oak Woodland	Southern Dry Forest	Southern Dry-mesic Forest	Surrogate Grasslands
High Probability of Occurring in the Western Coulee and Ridges Ecological Landscape								
Acadian Flycatcher						L	S	
American Woodcock				L		L		L
Bell's Vireo		M		L				M
Black Rat Snake	S	S		M	S	S	S	
Black-billed Cuckoo				L				
Blanding's Turtle		S		S	M		M	
Blue-winged Teal		L						M
Blue-winged Warbler				M	M	M	M	
Bobolink				L				S
Brown Thrasher		M		S				M
Bullsnake	S	S		S	S	M	M	
Cerulean Warbler					M	L	S	
Dickcissel		L		L				S
Eastern Massasauga Rattlesnake		S						
Eastern Meadowlark		M		M				S
Field Sparrow		S		S				M
Four-toed Salamander			L					
Goldeye								
Grasshopper Sparrow		S		L				S
Henslow's Sparrow				M				S
Hooded Warbler							S	
Kentucky Warbler							M	
Lark Sparrow		M						
Least Flycatcher					L	L	L	
Louisiana Waterthrush							S	
Northern Bobwhite		M		M	L			S
Northern Harrier		M						S
Northern Long-eared Bat				L	M	M	M	
Northern Prairie Skink	M	S		S	M	M	M	
Ornate Box Turtle		S		S	S	S	S	
Peregrine Falcon	S							

SGCN continued...

	Dry Cliff	Dry Prairie	Moist Cliff	Oak Opening	Oak Woodland	Southern Dry Forest	Southern Dry-mesic Forest	Surrogate Grasslands
Pickereel Frog								
Prairie Racerunner		S		S				
Prairie Ringneck Snake		S		S	M	M	M	
Prothonotary Warbler								
Red-headed Woodpecker				S	S	M	M	
Red-shouldered Hawk							M	
Timber Rattlesnake	S	S		S	S	S	S	
Veery					L		M	
Vesper Sparrow		S		M				L
Western Meadowlark		M						S
Western Sand Darter								
Western Slender Glass Lizard		S		M				
Western Worm Snake		S				M	M	
Whip-poor-will					S	S	S	
Willow Flycatcher		L		L				M
Wood Thrush					M	M	S	
Wood Turtle		S		M	M			
Worm-eating Warbler						M	S	
Yellow-bellied Racer	M	S				M	M	
Yellow-billed Cuckoo					L	L	M	

	Dry Cliff	Dry Prairie	Moist Cliff	Oak Opening	Oak Woodland	Southern Dry Forest	Southern Dry-mesic Forest	Surrogate Grasslands
Moderate Probability of Occurring in the Western Coulee and Ridges Ecological Landscape								
American Golden Plover								M
Buff-breasted Sandpiper								M
Eastern Red Bat				M	M	M	M	
Franklin's Ground Squirrel		L		S	M			M
Hoary Bat				L	L	L	L	
Prairie Vole		S		M				M
Short-eared Owl		M						S
Silver-haired Bat				L	L	L	L	
Upland Sandpiper		S		L				S
Woodland Vole				S	S	S	S	
Yellow-throated Warbler							M	

APPENDIX E

Coulee Experimental Forest Breeding Bird Survey Results

Bird tallies from June 2006 and June 2007 breeding bird surveys. Participants in 2006 were Armund Bartz, James Dalton, Dean Edlin, Eric Epstein, Kim Grveles, David Matheys, John Nelson, Yoyi Steele, and David Troester. Additional surveys were conducted by Barb Duerkson in 2007 at select locations. Figure E.1 illustrates the locations for both bird surveys.

Table E.1. Results from 2006 surveys

Species	# per Area					Total Observed	Comments
	A	B	C	D	E		
Canada Goose	0	0	0	0	4	4	Fly over
Ring-necked Pheasant	1	0	1	0	0	2	
Wild Turkey	0	1	0	5	1	7	
Mourning Dove	0	0	1	0	3	4	
Yellow-billed Cuckoo	1	3	0	0	0	4	
Barred Owl	0	0	0	1	0	1	
Ruby-throated Hummingbird	0	0	1	0	0	1	
Red-bellied Woodpecker	5	2	3	1	2	13	
Yellow-bellied Sapsucker	4	1	1	2	0	8	
Downy Woodpecker	4	2	0	1	1	8	
Hairy Woodpecker	0	1	2	0	1	4	
Northern Flicker	2	2	0	0	1	5	
Pileated Woodpecker	2	0	0	2	0	4	
Eastern Wood Pewee	10	10	8	8	7	43	
Acadian Flycatcher	1	0	0	0	0	1	
Eastern Phoebe	2	1	0	0	1	4	
Great-crested Flycatcher	2	1	0	3	4	10	
Blue Jay	3	2	2	7	4	18	
American Crow	1	3	3	2	6	15	
Black-capped Chickadee	2	3	4	2	9	20	
Tufted Titmouse	3	2	3	3	1	12	
White-breasted Nuthatch	3	3	5	2	1	14	
House Wren	0	0	0	0	4	4	
Blue-gray Gnatcatcher	4	2	3	6	6	21	
Veery	5	2	7	4	5	23	
Hermit Thrush	0	0	0	0	1	1	
Wood Thrush	1	3	0	4	2	10	
American Robin	4	0	6	0	1	11	
Gray Catbird	1	0	3	2	4	10	
Yellow-throated Vireo	2	2	3	2	2	11	
Red-eyed Vireo	15	7	13	8	15	58	
Blue-winged Warbler	4	0	5	5	4	18	
Yellow Warbler	0	0	0	0	1	1	
Chestnut-sided Warbler	0	0	0	0	1	1	
Cerulean Warbler	2	0	0	0	0	2	
American Redstart	8	2	5	1	9	25	
Ovenbird	21	13	19	19	13	85	
Mourning Warbler	3	2	1	0	1	7	

Table E.1 continued...

Species	# per Area					Total Observed	Comments
	A	B	C	D	E		
Common Yellowthroat	1	0	0	1	5	7	
Scarlet Tanager	6	3	5	8	1	23	
Cardinal	4	5	5	9	9	32	
Rose-breasted Grosbeak	7	10	0	3	5	25	
Indigo Bunting	0	0	0	3	0	3	
Eastern Towhee	3	4	5	5	4	21	
Chipping Sparrow	3	0	2	2	2	9	
Field Sparrow	0	0	0	0	3	3	
Song Sparrow	1	0	0	2	5	8	
Red-winged Blackbird	0	0	0	0	1	1	
Brown-headed Cowbird	3	3	15	11	4	36	
American Goldfinch	0	0	8	0	6	14	

Table E.2. Bird checklist from 2007 breeding bird surveys.

Red-tailed Hawk
Broad-winged Hawk
Mourning Dove
Black-billed Cuckoo
Yellow-billed Cuckoo
Barred Owl
Red-headed Woodpecker
Red-bellied Woodpecker
Yellow-bellied Sapsucker
Downy Woodpecker
Hairy Woodpecker
Pileated Woodpecker
Eastern Wood-Pewee
Acadian Flycatcher
Eastern Phoebe
Great Crested Flycatcher
Yellow-throated Vireo
Red-eyed Vireo
Blue Jay
American Crow
Black-capped Chickadee
Tufted Titmouse
White-breasted Nuthatch
House Wren
Blue-gray Gnatcatcher
Veery
Wood Thrush
American Robin
Gray Catbird
American Redstart
Ovenbird
Mourning Warbler
Hooded Warbler
Scarlet Tanager
Chipping Sparrow
Northern Cardinal
Rose-breasted Grosbeak
Indigo Bunting
Brown-headed Cowbird
American Goldfinch

Figure E.1

General location of Coulee Experimental Forest Breeding Bird Surveys. Polygons indicate 2006 survey areas, dots represent 2007 survey locations.

